GETTING STARTED WITH LEAN CONSTRUCTION

A guide for project teams

AUTODESK® BIM 360™

HOW TO USE THIS DOCUMENT

Outlined in this guide are foundational steps for helping project teams improve the predictability and profitability of commercial construction projects by leveraging lean construction practices. Throughout this document, look for the *Action Exercise!* callouts, which include questions to help you assess where your project team stands with the production planning process.

WHAT IS LEAN CONSTRUCTION?

There's a big problem in commercial construction: Significant resources– from time to material to labor–are invested in activities that don't deliver value to the customer.

37% of contractors in the construction industry are not familiar with any lean practices.

McGraw Hill Construction SmartMarket Report: Lean Construction – Leveraging Collaboration and Advance Practices to Increase Project Efficiency

WHAT IS LEAN CONSTRUCTION?

Currently, 70% of projects are over budget and delivered late.* Schedule bottlenecks, material movement, lack of schedule commitment, and rework of errors are just some of the roadblocks that lead to unproductive time on projects.

Lean construction is a way to eliminate waste of resources on construction projects. Teams take a "leaner" approach to the processes and mechanisms used to deliver projects to owners.

For contractors, deploying lean construction practices in a production planning process is a major undertaking. It requires movement away from the traditional command-and control planning process, and gaining buy-in from stakeholders at the highest levels of the organization.

57% of construction project spending equate to waste.*

70% of construction projects are over budget and delivered late.*

*Lean Construction Institute: What is Lean Construction. https://www.leanconstruction org/about-us/what-is-lean-design-construction/

FACTORS THAT LEAD TO WASTE ON CONSTRUCTION PROJECTS

Perhaps the only constant for construction projects is variability. Unexpected changes and other disruptions can occur many times—daily—on a typical commercial construction project. Two inherent qualities of construction projects contribute to variability, and make it challenging for teams to identify issues or quickly adapt to change:

1. EVOLVING WORK ENVIRONMENT

Whether it's a renovation, or a brand new structure, every construction project starts out as a custom project. Unlike traditional manufacturing, where workers come to a factory to work in an orderly, assembly-line fashion, the work environment for construction projects is usually evolving right along with the project.

2. DIFFERENT "TEAMS OF TEAMS"

Commercial construction projects bring together a number of different specialists—from architects to general contractors to mechanical, electrical, and plumbing (MEP) contractors—who may or may not have worked together on projects before. The combination of competing interests and priorities and different personalities and processes can make planning difficult. These factors can erode the predictability and profitability of any construction project.

WHY TRADITIONAL PROJECT PLANNING DOESN'T WORK

The traditional process for managing construction projects has long been centralized, with the superintendent taking a command-and-control approach to setting the schedule for how and when work is to be completed.

84% of lean practitioners found that adopting lean has led to higher quality projects.*

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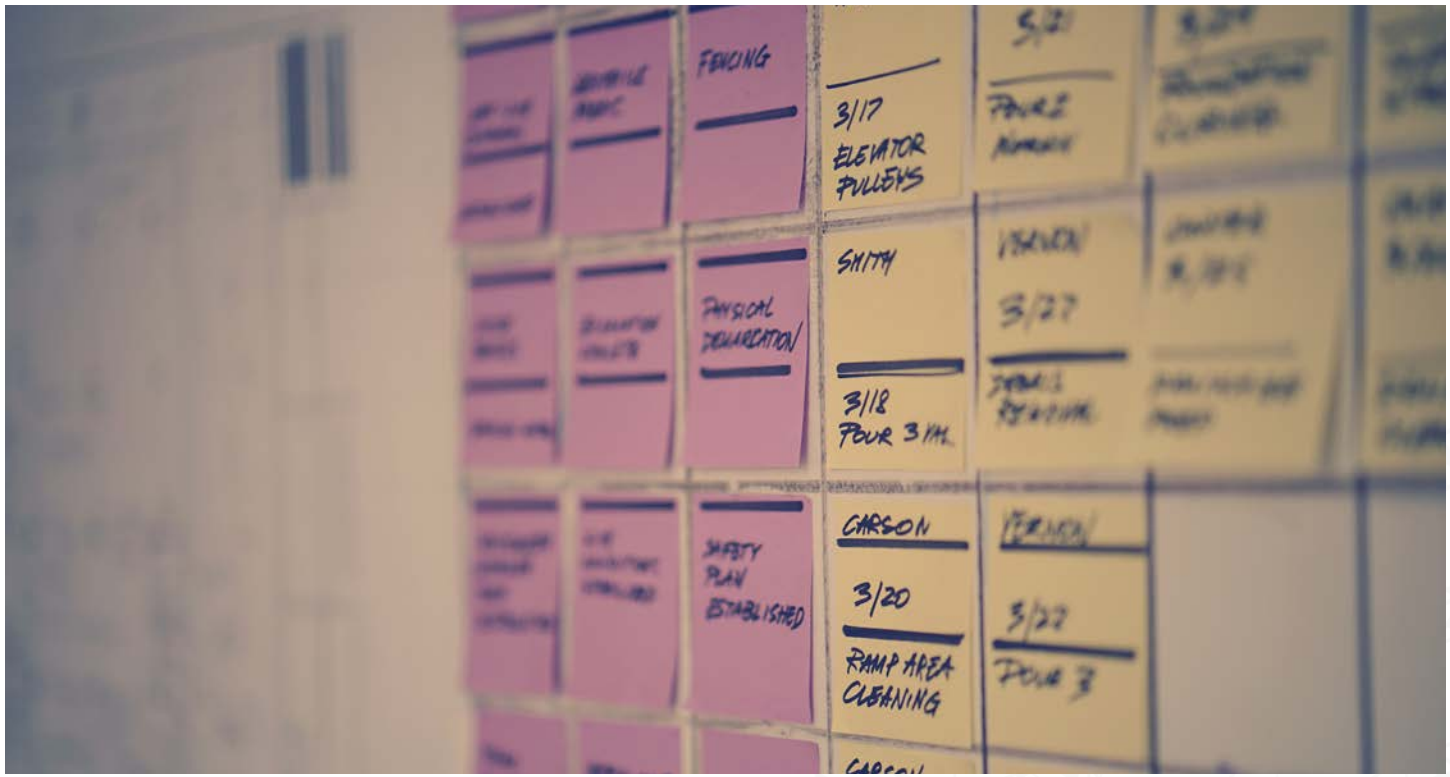
WHY TRADITIONAL PROJECT PLANNING DOESN'T WORK

Traditional project planning does not encourage participation by stakeholders, or invite the idea sharing necessary to complete milestones on time and without incurring waste. In addition, traditional project planning is not organized to deal with problems that inevitably occur between milestones, and can delay progress and completion of tasks progressing towards those milestones. The further ahead you try to plan, the more likely forecasts will be wrong.



WHY TRADITIONAL PROJECT PLANNING DOESN'T WORK *(cont.)*

A better approach is **PRODUCTION PLANNING.** Work is broken down into small tasks that can be planned and executed reliably.

A CONTINUOUS FLOW OF WORK

Effective production planning is foundational to lean construction.

It helps project teams to:

- Improve planning accuracy and reliability
- Eliminate waste
- Build a culture of commitment and accountability
- Establish an environment of open (transparent) and honest communication
- Identify and manage roadblocks
- Learn from the experience and improve as a team

LAST PLANNER® METHODOLOGY

Think of production planning like manufacturing production—a continuous flow of work. Construction projects are networks of commitments. They involve hundreds and thousands of handoffs between trades or workgroups. So, for project success, it is essential to understand how those commitments will be fulfilled. That means engaging the experts: the "last planners." **Last planners are typically the foremen of subcontractors or trade partners on a construction project. They are the last people who have an opportunity to plan the work before it actually gets done.**

The Last Planner® methodology is central to production planning. The last planners are invited into the planning process so they bring their knowledge and expertise to the discussion and help create a detailed breakdown of the pull/phase plan, described later in the guide.

5 STEPS TO IMPLEMENTING PRODUCTION PLANNING

How the majority of lean practitioners increase efficiency:

90% undertake offsite prefabrication

78% just-in-time material delivery

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INTRODUCTION: **PRODUCTION PLANNING & THE MASTER SCHEDULE**

Before adopting production planning, it is important for project teams to understand that the work plan developed through the process is not meant to replace the master schedule. Production planning is intended to help the project team to be the most productive, with the least amount of waste, within the master schedule parameters.

Major project milestones are identified from the master schedule pull/phase planning (Step 1 of production planning, described on the next page). These milestones are brought into the production plan. Any updates to key milestones are reflected back into the master schedule.

The end result of this process is a master schedule that summarizes the construction project at a high level. The project team therefore should not try to incorporate all of the production planning details into the master schedule.

Next are are five key steps to the

PRODUCTION PLANNING PROCESS >

ACTION EXERCISE!

Assemble your team & answer these questions:

1. Do all team members have access to a current copy of the master schedule and are they aware of major project milestones?
2. Is the master schedule defined at a high level with less detail and longer duration activities than the weekly work plan?
3. Are you adding current master schedule milestones to your production plan?
4. Do you update the master schedule milestones based on changes to the production plans?

STEP 1: PULL/PHASE PLAN

This first step of the production planning process involves determining the sequence of work that must occur to achieve the milestones in the master schedule:

1. Begin by identifying a single milestone.
2. Work backwards to develop the most efficient sequence of work.
3. Document each step.
4. Arrange each step in the correct sequence.

The pull/phase plan process should focus on critical handoffs between trades. This approach will help project teams proactively identify and resolve potential roadblocks that could interfere with completion of the planned work sequence. The idea is not to plan too far in advance– just far enough out that potential roadblocks can be identified and removed before they lead to time delays and other waste.

NOTE: Be sure that each documented step clearly defines the list of direct suppliers required for the particular step outlined.

Steps can be documented using sticky notes that are placed in sequence on a wall, or using a digital format using software (cloud or desktop based).

ACTION EXERCISE!

Assemble your team & answer these questions:

1. Do you schedule periodic pull/phase plan sessions to develop the work sequencing and clarify handoffs for upcoming milestones?
2. Do you invite trade partners to participate in pull/phase plan sessions?
3. Do you have a process for breaking the pull/phase plan into rightsized activities (<5 days) for the overall production plan?
4. Do you expect to upload the results from your pull/phase plan sessions into the plan?

STEP 2: LOOK-AHEAD PLAN

Step 2 addresses the resolution of known constraints or roadblocks that must be resolved – like outstanding RFIs, submittals and change orders – to keep work sequences on track.

Often, these roadblocks involve stakeholders outside of the on-site team, such as project owners, architects, engineers, and permitting organizations. That means project teams can't always directly control resolution of critical roadblocks. They need time to get others to help. The look-ahead plan—which looks forward six weeks into the project—provides that time.

More than just a snapshot of the baseline master schedule, the look-ahead plan is a detailed breakdown of the pull/phase plan that was developed by the last planners in Step 1. It clearly defines work that can be performed, and by when, and identifies handoffs between trades and workgroups. Clear ownership for roadblock removal is determined and a specific timetable for resolution is set.

The look-ahead plan is part of the overall production planning horizon. In an extended coordination meeting each week, the project team reviews performance from the previous week and then finalizes the weekly work plan for the week to come (Step 3, described on next page). During this meeting, they may also review the four- to six-week look-ahead horizon to identify potential roadblocks and discuss how to resolve them.

ACTION EXERCISE!

Assemble your team & answer these questions:

1. Do you look ahead 4-6 weeks and identify, on a weekly basis, constraints/roadblocks that must be resolved in order to implement the plan?
2. Do you assign responsibility for removal of roadblocks to specific individuals?
3. Will you be tracking resolution of those roadblocks in the plan?

STEP 3: WEEKLY WORK PLAN COORDINATION

The weekly work plan, created by the last planners each week, is the most reliable commitment of what will be done during the next week. Only work that can be accomplished in the designated time frame is put into this plan. Following are the three phases of weekly work plan coordination:

PHASE 1: MEETING PREPARATION

Thursdays are ideal for the meeting because it gives the project team time to resolve any open questions and finalize the plan by Friday. The meeting should last about 45-60 minutes. All key members of the project team, including the last planners who will make commitments for the crews in the field, should be required to attend.

Before the team meeting, the superintendent should set clear expectations for coordinating the weekly work plan:

- Trade partners should come prepared with planned activities for the upcoming week.
- If new activities are planned, they must be added to the weekly work plan prior to the meeting.
- All activities planned should take no longer than five days to complete.

PHASE 2: MEETING MANAGEMENT

The superintendent should facilitate discussion during the weekly work plan meeting. Five minutes should be devoted to the topic of safety, and then about 10 minutes should be spent reviewing results from the previous week. As part of the results review, all committed activities should be updated, if they have not been updated in daily check-in meetings (see Step 4, next page). In addition, Plan Percent Complete (PPC), a simple calculation used to determine what percentage of planned commitments were actually delivered in a given week, and root causes (factors creating roadblocks) should be reviewed. Use the remaining meeting time to finalize the production plan for the coming week. Each trade presents their plan, and every stakeholder agrees to explicit commitments. Anything that requires extended discussion should be tabled for appropriate follow-up at a later time.

PHASE 3: POST MEETING

The production plan should be updated by the project/field engineers and/or trade partners within four hours after the meeting and distributed to all participants immediately.

STEP 4: DAILY CHECK-INS

Regular check-ins are essential to the Last Planner® methodology and the "accountability workflow" that ultimately drive lean construction practices.

The project team should meet daily in the field for about 15 minutes to manage weekly work plan commitments. During the daily check-in, the project team should discuss logistics and roadblocks, and update the status on commitments (completions or incompletions). Incomplete work is rescheduled. These team "huddles" can occur at the beginning or end of shifts.

ACTION EXERCISE!

Assemble your team & answer these questions:

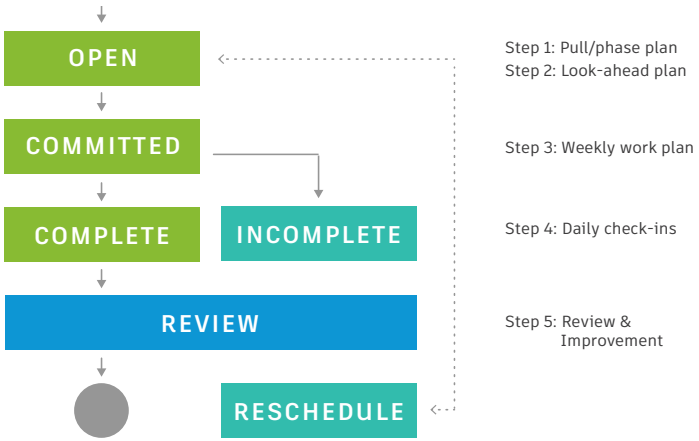
1. Do you hold brief daily update meetings to review the previous day's results and update the weekly work plan?
2. Are trade foremen included in the meeting?
3. Do you update commitment status (complete/incomplete) during this meeting?
4. Do you share the production plan (hard copy or live) during the meeting?

STEP 5: REVIEW & IMPROVEMENT

In this final phase of production planning, project teams learn from their failures to complete promised work by tracking whether deliverables/ actions have been executed by the date promised.

They then chart the results, which are discussed during the weekly work plan meeting. Using metrics such as PPC and root causes, the team creates an action plan for improvement, and best practices are communicated to the project stakeholders.

ACCOUNTABILITY WORKFLOW



ACTION EXERCISE!

Assemble your team & answer these questions:

1. Do you present the look-ahead plan to the project stakeholders on a regular basis?
2. Do you present performance reports (PPC, root causes) to the owner(s) on a regular basis?
3. Do you review roadblocks with the project stakeholders on a regular basis?
4. Are you applying what you've learned to continually improve?

ROLES AND RESPONSIBILITIES FOR PRODUCTION PLANNING

3% of warranty or rework claims are due to misguided construction planning and scheduling and/or leadership and communication.

McGraw Hill Construction SmartMarket Report: Lean Construction – Leveraging Collaboration and Advance Practices to Increase Project Efficiency

ROLES AND RESPONSIBILITIES FOR PRODUCTION PLANNING

Before moving ahead with the production planning process, ownership of core responsibilities related to each of the five steps must be assigned. Following are the four main roles in production planning, and their typical responsibilities:

GENERAL CONTRACTOR SUPERINTENDENT(S)

- Lead the production planning process.
- Reinforce and use the process to manage production in the field against the completion dates referenced in the master schedule.
- Facilitate the pull/phase planning sessions.
- Review the look-ahead plan submitted by trade partners.
- Participate in daily check-ins.
- Use the agreed-upon work plan and process to drive production.

PROJECT/FIELD ENGINEERS

- Ensure documentation and thoroughness of the production planning process.
- Capturing updates and changes in the weekly coordination meeting.
- Helping trade partners to provide input to and track the status of weekly work plans.

Roles continue on the next page:

ROLES AND RESPONSIBILITIES FOR PRODUCTION PLANNING *(cont.)*

LAST PLANNERS

- Provide input for the production plan, manage the crews who execute the plan
- Take part in pull/phase planning meetings as required.
- Submit the look-ahead plan each week.
- Participate in weekly coordination meetings and make clear commitments for weekly tasks.
- Attend daily check-ins in the field and provide accurate status on completion of commitments.
- Use the production planning process to bring detail into the internal planning process and drive production from trade foremen on critical areas and systems.

PROJECT MANAGERS

- Facilitate the removal of roadblocks encounteredon the project
- Manage communication with the project owner(s).
- Provide resources needed by last planners to execute the plan.

PUTTING LEAN INTO ACTION

You learned the importance of lean, the reasons why traditional project planning doesn't work, and how to get started. Now, it's time to put your lean practices into action. Use the following guidelines as well as steps listed in the Action Exercises found throughout the document.

1. Assemble your team and collectively answer key questions around scheduling, planning, and accessibility.
2. Determine the sequence of work that must occur during your production planning process to achieve the milestones in the master schedule.
3. Develop your look-ahead plan to clearly define work that can be performed, and by when.
4. Task last planners to create a weekly work plan coordination schedule that outlines the commitment of what will be done during the next week.
5. Ensure regular check-ins are scheduled. These are essential to the Last Planner[w] methodology and the "accountability workflow" that ultimately drives lean construction practices.
6. Evaluate project performance often - create an action plan for improvement and communicate best practices to project stakeholders.

READY TO GET EVEN LEANER?

Getting started with production planning is a great way to reduce waste on your projects. But that's just the beginning.

There's opportunity to reduce waste throughout your construction project, but you need to understand the root cause. We call these the "16 Dominoes of Construction Waste". Do any of these sound familiar?

- **Delivery of plans without finishing coordination.** Best case, this creates lots of costly RFIs. Worst case, you have to ask the owner for more information.
- **Changes to scope mid-construction.** Always disruptive, and oftentimes the cause of costs going up and productivity and safety going down.
- **Finger pointing and blame.** When waste extends beyond the completion of the project, profits are eroded.

We can help you identify these – and 13 more – areas of waste. And more importantly, show you how you can avoid them. Read our blog post to learn more about the 16 Dominoes of Construction Waste, and how Autodesk BIM 360 can help to avoid the "domino effect".

GET LEANER

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